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## Description

This invention relates to an improved interior member for vehicles and also to a method for its manufacture.

5 The interior member is required for absorbing a shock to a driver or a passenger, for maintaining a good surface feeling to the touch and appearance and furthermore for ornamental purposes. It is, for example, used for a knee pad 10 and an instrument panel 11 both shown in Fig. 6 as well as for door trim, quarter trim, a console lid, a center pillar or a pillar garnish.

The interior members generally used are: (1) one composed of only rigid plastic with proper surface  
10 patterns; (2) one including layers of semi-rigid polyurethane foam (so-called spray skin foam), a surface film formed by transferring from the coated die surface on the die and a metal insert layer; (3) one made of rigid plastic with fluffed surface; (4) one including a rigid plastic substrate covered with a plastic surface film; and (5) one including layers of a metal insert, semi-rigid polyurethane foam and a plastic surface film. An example of the interior member widely used is shown in Fig. 7, in which a cushion pad 14 is formed  
15 between a metal insert (a steel plate) 12 and a surface layer 16. This metal insert 12 is used for absorbing impact, as in a knee pad, and for maintaining its shape, as in a console lid.

The above interior members, however, have the following problems. As for the members (1), (3) and (4), especially for the member (1), the surface feeling is wrong, lacking softness. Moreover, the manufacturing processes, especially that for surface preparation, of the members (3) and (4) are rather complicated. As  
20 for the members (2) and (5), the metal insert increases the weight and cost of the interior member, and it takes much time to form polyurethane foam.

Since an instrument panel often has leather like grained patterns, other interior members of the vehicle such as a pillar garnish are desired to have the same patterns. The prior art interior members for the pillar garnish however, can obtain only indistinct grained patterns.

25 A fabric is generally used as a surface material for seats of a vehicle because of its good surface appearance and feeling. In order to totally coordinate the interior parts of the vehicle, a pillar garnish uses an interior member, made of a surface layer, and a rigid plastic substrate, where the surface layer is composed of the fabric surface and flexible polyurethane foam. This member, however, has problems: it takes time to integrate the surface layer to the substrate; and, because the surface layer prevents vacuum  
30 forming, the member can be applied only on interior parts with a simpler shape. Therefore, total decorative coordination of various interior parts is difficult.

The invention as claimed is intended to remedy these drawbacks. According to the invention, an interior member for vehicles includes a substrate containing a reinforcing fiber mat permeated with a polyisocyanurate, and a surface layer integrally formed on the substrate. Here, the polyisocyanurate is  
35 produced by polyol and polyisocyanate reacting in the presence of a trimerization catalyst. This material is characterized in that the density of the polyisocyanurate in the substrate is 1.22 to 1.9 times as much as the density of the same polyisocyanurate in its free foaming state. The surface layer may include non-foamed plastic as an outer layer and foamed plastic as an inner layer, which are formed by melting a plastic powder in a heated mold. Alternatively the surface layer may include layers of a fabric, a resilient foam and  
40 a thermoplastic resin sheet.

The manufacturing method of the interior member of the invention includes the steps of:

- (a) laying a desired surface layer in a cavity of a mold;
- (b) placing a reinforcing fiber mat onto the surface layer;
- (c) pressing the surface layer and the reinforcing fiber mat in the mold;
- 45 (d) injecting raw material for obtaining a polyisocyanurate into the cavity of the mold, the raw material including a trimerization catalyst, a polyol and a polyisocyanate, the amount of the injected raw material being so determined that the density of the obtained polyisocyanurate is 1.22 to 1.9 times as much as the density of the same polyisocyanurate in its free foaming state; and
- (e) demolding an integrally-molded interior member from the mold after the completion of the reaction  
50 of the raw (polyisocyanurate) material.

Since the substrate of the interior member of the invention consists of a reinforcing fiber mat permeated with polyisocyanurate, the interior member can be decreased in weight more than a conventional interior member whose substrate contains a heavy metal insert. For example, a knee pad of this invention is a half weight compared with conventional one. Furthermore, it is possible to decrease the thickness of the  
55 substrate because of its sufficient strength.

The density of the polyisocyanurate in the substrate is 1.22 to 1.9 times as much as that in its free foaming state. Thus, the substrate possesses both appropriate rigidity and sufficient strength. Namely, it normally maintains the shape of the interior member, but deforms in response to an impact and collapses in

response to an especially great impact so as to absorb or decrease the impact for protecting a driver or a passenger.

Since having low viscosity in the initial state of the reaction, the polyisocyanurate material injected into the mold can easily and homogeneously permeate the reinforcing fiber mat. Therefore, the substrate of this interior member contains uniform properties. While curing the polyisocyanurate material to form a substrate, a surface layer and the substrate are integrally-molded by the adhesive effect of the polyisocyanurate itself and, as occasion demands, by an adhesive applied on the surface layer. Thus, the process of manufacturing the interior member is neither complicated nor costly.

The good surface appearance and feeling is obtained by covering the substrate with an appropriate surface layer. When the surface layer consists of non-foamed plastic as an outer layer and the inner layer of foamed plastic, the good surface feeling is obtained by its outer layer and the softness is obtained by its inner layer. Since these layers are formed by melting plastic powder in a heated mold, it can easily have clear and fine grained patterns on its surface by applying the patterns in the mold. When the surface layer consists of layers of a fabric, a resilient foam and a thermoplastic resin sheet, the good surface appearance and feeling is obtained by the fabric and the resilient foam. The thermoplastic resin sheet makes it possible to vacuum-form the surface layer. Thus, an interior member of a vehicle having a complicated shape can be also formed without difficulty. Since the thermoplastic resin sheet is used as the innermost layer, it prevents the polyisocyanurate material from permeating the resilient foam of the surface layer, thus preventing the good surface feeling from deteriorating. In either compositions of the surface layer, it is possible to totally coordinate the interior parts of a vehicle.

Accordingly, the interior member of the invention has good surface appearance and feeling to the touch, is lightweight and whose manufacturing method and construction is less complicated and manufacture is less costly. It is thin and can have clear and fine surface patterns, such as leather like grain, realizing the decorative interior parts of a vehicle that are totally coordinated.

#### Brief Description of Drawings

The invention may be best understood by referring to the following detailed description of preferred embodiments and the accompanying drawings, wherein like numerals denote like elements and in which:

Fig. 1 is a sectional view of an interior member in a first embodiment of the invention;

Fig. 2 is a sectional view illustrating a process for manufacturing the interior member in the first embodiment;

Fig. 3 is a sectional view illustrating another process for manufacturing the interior member in the first embodiment;

Fig. 4 is a sectional view of an interior member in a second embodiment of the invention;

Fig. 5 is a sectional view of an interior member in a third embodiment of the invention;

Fig. 6 is a side view of the inside of an automobile; and

Fig. 7 is a perspective view of a prior art knee pad, with the section.

#### Best Mode for Carrying Out the Invention

Hereafter preferred embodiments of the invention will be described in detail according to the attached drawings.

Fig. 1 is a sectional view of an interior member 20 in a first embodiment which consists of a substrate 22 and a surface layer 24. The substrate 22 is formed by permeating a poly-isocyanurate through a reinforcing fiber mat 23. The poly-isocyanurate is obtained by the reaction of a polyol and a polyisocyanate in the presence of a trimerization catalyst. The amount of the polyisocyanurate is so determined that the density of the polyisocyanurate in the substrate is 1.22 to 1.9 times as much as that in its free foaming state.

The trimerization catalyst used may be any of a carboxylate, a tertiary amine, a base or alkaline inorganic salt, a phosphine and a quaternary ammonium salt. The carboxylate is, for example, an alkali metal salt, a lead salt or an iron salt of carboxylic acid. The tertiary amine is, for example, a trialkylamine or a dialkylaminoalkylphenol. The inorganic base or salt is, for example, potassium hydroxide or sodium carbonate. The phosphine is, for example, a triethyl phosphine. Especially, the alkali metal salt of a carboxylic acid containing 1 to 18 carbon atoms or the quaternary ammonium salt is preferable. Dibutyltin dilaurate can be used as a subsidiary catalyst.

The polyol used may be any of ethylene glycol, diethylene glycol, neopentyl glycol, 1,6-hexanediol, 1,4-butanediol, 1,4-cyclohexanedimethanol, glycerol, trimethylolpropane and pentaerythritol. A polyester polyol or a polyether polyol prepared from the above polyols can also be used as the polyol.

The polyisocyanate used may be one or more selected from an aliphatic polyisocyanate, an alicyclic polyisocyanate and an aromatic polyisocyanate. The aliphatic polyisocyanate is, for example, hexamethylenediisocyanate. The alicyclic polyisocyanate is, for example, isophoronediiisocyanate. The aromatic polyisocyanate is, for example, tolylenediisocyanate (TDI), diphenylmethanediisocyanate (MDI), naphthylenediisocyanate or xylylenediisocyanate. Especially the aromatic polyisocyanate such as TDI or MDI is preferable. The aromatic polyisocyanate may be used as crude TDI, crude MDI (polymethylene-polyphenylisocyanate) or modified MDI (carbodiimide modification or polyol modification). The amount of the polyisocyanate used is 250 to 3,000—preferably 1,500 to 2,500—on an isocyanate index.

The reinforcing fiber mat 23 preferably contains long glass-fibers, averaging 15 through 20 microns ( $\mu\text{m}$ ) in average diameter and over 50 mm in average length. This reinforcing fiber mat 23 may be used in one sheet or in plural layers according to a target thickness of the substrate 22. A subsidiary reinforcement by such strong fibers as carbonfibers or Kevlar fibers (trade name of DuPont) can be used together with the ordinary glass fiber mat in parts requiring greater strength.

The amount of the polyisocyanurate to be permeated through the reinforcing fiber mat 23 is so determined that the density of the polyisocyanurate in the substrate 22 is 1.22 to 1.9 times as much as the density of the same polyisocyanurate in its free foaming state. Here, free foaming refers to foaming which does not occur in a closed mold and in which the polyisocyanurate is not permeated in the reinforcing fiber mat. The density of the polyisocyanurate in the substrate 22 is calculated as

(weight of the polyisocyanurate)/(clearance volume  
between fibers of the reinforcing fiber mat).

In calculating the density, the weight of the polyisocyanurate is equal to the total weight of raw material injected in the mold for obtaining the polyisocyanurate between the reinforcing fiber mat 23. The clearance volume between fibers of the reinforcing fiber mat 23 is, for example, calculated as follows.

First, the weight  $x$  of a vessel containing water is measured. Then measured is the total weight  $y$  when a reinforcing fiber mat A of a certain size is suspended in the water. The volume  $v_1$  of the reinforcing fiber mat A is calculated from its outside dimensions. The total volume  $V_1$  of a reinforcing fiber mat 23 used for the interior member 20 of a vehicle is calculated from its outside dimensions, the engineering drawings or the dimension of the substrate 22. The volume  $z$  occupied by fibers in the reinforcing fiber mat A is acquired by an equation  $z = (y - x)/d_w$ , where  $d_w$  is the density of water and is equal to unity. The clearance volume  $v_2$  between fibers of the reinforcing fiber mat A is found from an equation  $v_2 = v_1 - z$ . As a result, the total clearance volume  $V$  between fibers of the reinforcing fiber mat 23 used for the interior member 20 of a vehicle is calculated by an equation  $V = v_2 \cdot V_1/v_1$ .

Taking account of its moldability and decorative effects as an interior member 20 of the vehicle, the composition of the surface layer 24 is selected from: a plastic sheet such as polyvinyl chloride resin; a sheet of plastic foam; laminated layers of a fabric and a plastic film; and laminated layers of a fabric, a sheet of plastic foam (flexible polyurethane foam is an example) and a plastic film.

Examples of the composition of the polyisocyanurate material are shown below. Here, "part" refers to weight and MW stands for a molecular weight.

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## Example 1

Polyol: polyether polyol prepared from glycerol  
5 functional groups 3  
MW 3,000  
.....100 parts  
10 Polyisocyanate: modified MDI  
free NCO contained 29%  
15 .....239 parts  
Trimerization Catalyst: potassium octylate  
.....0.3 part  
20 Isocyanate Index: 1,650

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## Example 2

Polyol: polyether polyol prepared from ethylene glycol  
functional groups 2  
MW 3,000  
.....100 parts  
Polyisocyanate: modified MDI  
free NCO contained 29%  
.....187 parts  
Trimerization Catalyst: potassium octylate  
.....0.3 part  
Isocyanate Index: 2,000

## Example 3

Polyol: polyether polyol prepared from glycerol  
functional groups 3  
MW 1,500  
.....100 parts  
Polyisocyanate: modified MDI  
free NCO contained 29%  
.....420 parts  
Trimerization Catalyst: potassium octylate  
.....0.1 part  
Subsidiary Catalyst: dibutyltin dilaurate  
.....0.1 part  
Isocyanate Index: 1,500

Various properties of the substrate 22 using the polyisocyanurate material of Example 1 are shown in Table 1.

Table 1

Density of Substrate 5 (g/cm <sup>3</sup> )	1.15	1.18	1.22	1.30
Content of Reinforcing Fiber Mat* (weight %)	0	12.7	36.9	57.7
<sup>10</sup> Density of Polyiso- cyanurate in Substrate =A (g/cm <sup>3</sup> )	1.15	1.08	0.91	0.73
<sup>15</sup> Density of Polyiso- cyanurate in Free Foaming=B (g/cm <sup>3</sup> )	0.6	0.6	0.6	0.6
A/B	1.91	1.81	1.51	1.22
<sup>20</sup> Modulus of Bending Elasticity (10 <sup>4</sup> kg/cm <sup>2</sup> )	1.8	4.0	5.6	7.5
Bending Strength (kg/cm <sup>2</sup> )	650	1,200	1,800	2,400
<sup>25</sup> Tensile Strength (kg/cm <sup>2</sup> )	430	600	1,000	1,500
Elongation (%)	5	3	2	1
<sup>30</sup> Izod Impact Strength with Notch (kg·cm/cm)	8	20	38	45

<sup>35</sup> \* The fiber mat is a continuous strand mat of long glass fibers.

<sup>40</sup> Processes for manufacturing the above interior member 20 for a vehicle in the first embodiment are explained according to Figs. 2 and 3.

Fig. 2 is a sectional view showing one process for manufacturing the interior member 20. A mold is composed of a lower mold half 33 and an upper mold half 31 having an inlet 35. The lower mold half 33 and the upper mold half 31 have cavity faces so as to form a cavity in which an interior member 20 is shaped when closing the lower mold half 33 with the upper mold half 31.

<sup>45</sup> First, the surface layer 24 is laid in the cavity of the lower mold half 33. This lower mold half 33 may be preheated to 60 through 80°C. Second, the reinforcing fiber mat 23 is placed onto the surface layer 24. Alternatively, the fiber mat 23 can be attached under the upper mold half 31 by adhesive tape. The reinforcing fiber mat 23 may be previously made in a desired shape before it is set on the lower mold half 33, or a plain fiber mat 23 may be placed on the lower mold half 33 to be given the shape by the lower  
<sup>50</sup> mold half 33 and the upper mold half 31. Necessary hooks or fasteners for attaching the interior member 20 to the vehicle body are set in this stage at appropriate positions. Third, the lower mold half 33 is sealed with the upper mold half 31 so as to compress the surface layer 24 and the reinforcing fiber mat 23. Fourth, raw material for obtaining polyisocyanurate is injected from the inlet 35 into the cavity of the closed mold. Here,  
<sup>55</sup> the material includes a polyol, a polyisocyanate and a trimerization catalyst. A specific type of injection nozzle 37 can be utilized in which the polyol and the polyisocyanate may be separately led and shot into each other under high pressure at the inlet 35 so as to be injected simultaneously. At that time, if the pressure within the cavity is reduced to 0.33 to 0.46 kg/cm<sup>2</sup>, (32.4 to 45.1 kPa) the flow of the polyisocyanurate material is not prevented by the pressure in the cavity. Thus, the material can be



uniformly and homogeneously permeated through the reinforcing fiber mat 23 so as to obtain an interior member 20 with a complicated shape or a thin interior member 20.

The amount of the polyisocyanurate material injected is so determined that the density of the polyisocyanurate obtained by the reaction in the cavity is 1.22 to 1.9 times as much as the density of the same polyisocyanurate in its free foaming state. For example, if the density of the polyisocyanurate in its free foaming state is 0.6 g/cm<sup>3</sup>, the amount is determined to obtain 0.6 to 1.14 g/cm<sup>3</sup> of the density of the polyisocyanurate in the cavity. To be concrete, the amount of the polyisocyanurate material injected is calculated simply by

(density of the polyisocyanurate material).

(the total clearance volume between fibers of the reinforcing fiber mat).

The polyisocyanurate material injected into the cavity is then homogeneously permeated through the reinforcing fiber mat 23 and cured by catalysis of the trimerization catalyst of the material so as to form a substrate 22 while the surface layer 24 adheres to the substrate 22. Lastly, the integrally-molded interior member 20 is demolded.

The weight of the upper mold half 31 itself is enough for a locking pressure on sealing the lower mold half 33. Even if clamping of the upper mold half 31 is necessary, an ordinary injection pressure (usually under 2kg/cm<sup>2</sup> (ss196 kPa)) is sufficient for the clamping pressure. To strongly adhere the surface layer 24 onto the substrate 22, an adhesive may be applied on the surface layer 24 before the polyisocyanurate injection. The adhesive may be any of an urethane adhesive, an epoxy adhesive and an acrylic adhesive. In the first embodiment, required time period from the injection time of the polyisocyanurate material to the demolding time of the obtained interior member 20 is 30 to 60 seconds.

Fig. 3 is a sectional view showing another process for manufacturing the above interior member 20 of the first embodiment. A mold consists of a lower mold half 33a having holes 33b for making a vacuum, and an upper mold half 31a. Since the process according to Fig. 3 is almost the same as that according to Fig. 2, here only a brief explanation is given. First, a surface layer 24a is vacuum-formed in the lower mold half 33a. Second, a reinforcing fiber mat 23a is placed on the surface layer 24a. Third, raw material for obtaining a polyisocyanurate is injected by an injection nozzle 37a. Fourth, the lower mold half 33a is covered with the upper mold half 31a so as to complete the reaction of the material. Lastly, an integrally-molded interior member 20 is demolded. The injection of polyisocyanurate material may follow the closing of the lower mold half 33a by the upper mold half 31a depending on the reaction speed and the process facilities.

A second embodiment is now described according to Fig. 4.

Fig. 4 is a sectional view of a pillar garnish as an interior member 40 according to the invention. It consists of a surface layer 42 and a substrate 48, where the surface layer 42 includes non-foamed plastic as an outer layer 44 and foamed plastic as an inner layer 46. These two layers 44 and 46 are made of the same or different resin (for example, flexible polyvinyl chloride resin or its copolymer) and are formed by melting plastic powder in a heated mold. Generally, the thickness of the non-foamed plastic layer 44 is 0.3 to 0.5 mm and that of the foamed plastic layer 46 is 2.0 to 3.0 mm. The degree of foaming of the foamed plastic layer 46 is determined according to its properties and the shape or variety of the interior member 40. A process of manufacturing the surface layer 42 is briefly described.

A lower mold having desired patterns such as leather like grain is preheated. Plastic powder for forming the non-foamed plastic layer 44 is placed in the lower mold and the lower mold is then further heated. The plastic powder is melted by the heating and then is solidified by decreasing the temperature so as to form the non-foamed plastic layer 44. Another plastic powder for forming the foamed plastic layer 46 is added on the solidified layer 44 and the lower mold is again heated. The plastic powder forms the foamed plastic layer 46 in the same manner as above and thus the surface layer 42 is obtained. The substrate 48 is then formed on the surface layer 42 as in the first embodiment to obtain the pillar garnish 40.

A third embodiment is now described according to Fig. 5.

Fig. 5 is a sectional view of another pillar garnish 50 as a third embodiment of an interior member 50 of the invention. The interior member 50 also consists of a surface layer 52 and a substrate 54, as in the second embodiment. But the surface layer 52 includes layers of a fabric 56, a resilient foam 58 and a thermoplastic resin sheet 60. They are laminated with an adhesive or are press-formed by heat melting of the resilient foam 58. The surface layer 52 is shaped in a desired form by heating so as to soften the thermoplastic resin sheet 60, thus allowing vacuum-forming in the mold. Good surface appearance and feeling is obtained by the fabric 56 and the resilient foam 58. Since the thermoplastic resin sheet 60 is used as the innermost layer, it prevents the polyisocyanurate material from permeating into the resilient foam 58 of the surface layer 52, thus preventing the good surface feeling from deteriorating. Using the thermoplastic resin sheet 60 makes it possible to vacuum-form the surface layer. Namely, an interior part of a vehicle

having a complicated shape can be also formed without difficulty. The resilient foam 58 may be flexible polyurethane foam, and the thermoplastic resin sheet 60 may be a polyurethane film which can easily adhere to the polyisocyanurate. The substrate 54 is the same as that of the first embodiment.

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# Claims

1. An interior member for vehicles, comprising:
  - 10 a substrate containing a reinforcing fiber mat with a polyisocyanurate permeated therethrough, said polyisocyanurate being obtained by a reaction of a polyol and a polyisocyanate in the presence of a trimerization catalyst; and in the absence of an organic blowing agent and
  - a surface layer integrally formed on said substrate,
  - 15 wherein the density of the polyisocyanurate in said substrate is 1.22 to 1.9 times as much as the density of the same polyisocyanurate in its free foaming state.
2. An interior member for vehicles as claimed in claim 1, wherein said reinforcing fiber mat comprises glass-fibers averaging 15 through 20  $\mu\text{m}$  (microns) in average diameter and over 50 mm in average length.
- 20 3. An interior member for vehicles as claimed in claim 1, wherein the amount of the polyisocyanate used for obtaining said polyisocyanurate is 250 to 3,000 on the isocyanate index.
- 25 4. An interior member for vehicles as claimed in claim 3, wherein the amount of the polyisocyanate used is 1,500 to 2,500 on the isocyanate index.
5. An interior member for vehicles as claimed in claims 1, 2 or 3, wherein said surface layer comprises nonfoamed plastic as an outer layer and foamed plastic as an inner layer, which are formed by melting of plastic powder in a heated mold.
- 30 6. An interior member for vehicles as claimed in claims 1, 2 or 3, wherein said surface layer comprises layers of a fabric, a resilient foam and a thermoplastic resin sheet.
- 35 7. A method for manufacturing an interior member for vehicles, comprising steps of:
  - (a) laying a surface layer in a cavity of a mold;
  - (b) placing a reinforcing fiber mat onto said surface layer;
  - (c) compressing said surface layer and said reinforcing fiber mat in the mold;
  - (d) injecting raw material for obtaining a polyisocyanurate into the cavity of the mold, said
  - 40 polyisocyanurate having a density, which is 1.22 to 1.9 times as much as the density of the same polyisocyanurate in its free foaming state, said raw material comprising a trimerization catalyst, a polyol polyisocyanate and no organic blowing agent, and
  - (e) demolding an integrally-molded interior member from the mold after the completion of the reaction of the raw material.
- 45 8. A method as claimed in claim 7, wherein said reinforcing fiber mat used in step (b) comprises glass-fibers averaging 15 through 20  $\mu\text{m}$  (microns) in average diameter and over 50 mm in average length.
9. A method as claimed in claim 7, wherein the amount of the polyisocyanate of said polyisocyanurate material injected in step (d) is 250 to 3,000 on the isocyanate index.
- 50 10. A method as claimed in claim 7, wherein said trimerization catalyst used in step (d) is one or more selected from a carboxylate, a tertiary amine, an inorganic salt, a phosphine and a quaternary ammonium salt.
- 55 11. A method as claimed in claim 10, wherein said trimerization catalyst is an alkali metal salt of a carboxylic acid containing 1 to 18 carbon atoms.

12. A method as claimed in claim 7, wherein dibutyltin dilaurate is used in step (d) as a subsidiary catalyst.
13. A method as claimed in claim 7, wherein said polyol used in step (d) is one or more selected from ethylene glycol, diethylene glycol, neopentyl glycol, 1,4-butanediol, 1,6-hexanediol, 1,4-cyclohexanedimethanol, glycerol, trimethylolpropane and pentaerythritol.
14. A method as claimed in claim 13, wherein said polyol is a polyester polyol or a polyether polyol, prepared from said polyols, mentioned in claim 13.
15. A method as claimed in claim 7, wherein said polyisocyanate used in step (d) is one or more selected from an aliphatic polyisocyanate, an alicyclic polyisocyanate and an aromatic polyisocyanate.
16. A method as claimed in claim 15, wherein said aliphatic polyisocyanate is hexamethylenediisocyanate.
17. A method as claimed in claim 15, wherein said alicyclic polyisocyanate is isophoronediiisocyanate.
18. A method as claimed in claim 15, wherein said aromatic polyisocyanate is one of tolylenediisocyanate, diphenylmethanediisocyanate, naphthylenediisocyanate and xylylenediisocyanate.
19. A method as claimed in claim 7, wherein said mold is pre-heated to 60 through 80 ° C in step (a).
20. A method as claimed in claim 7, wherein said polyol and said polyisocyanate used in step (d) are separately led and are shot into each other under high pressure at an inlet of said mold so as to be injected simultaneously.
21. A method as claimed in claim 7, wherein said mold is a closed mold and the pressure of said closed mold is reduced to 0.33 to 0.46 kg/cm<sup>2</sup> 32.4 to 45.1kPa at the injection of said polyisocyanurate material in step (d).
22. A method as claimed in claim 7, wherein an adhesive is applied on said surface layer in step (a).
23. A method as claimed in claim 7, wherein said mold is composed of a lower mold half and an upper mold half and the lower mold half is closed by the upper mold half after the injection of said polyisocyanurate material in step (d) so as to complete the reaction of said material in step (e).

#### Revendications

1. Elément intérieur de véhicule comprenant: un substrat contenant un mat de fibres de verre de renforcement imprégné de polyisocyanurate, ledit polyisocyanurate étant obtenu par réaction d'un polyol et d'un polyisocyanate en présence d'un catalyseur de trimérisation et en l'absence d'agent gonflant organique et  
une couche de surface intégralement formée sur ledit substrat,  
caractérisé en ce que la densité du polyisocyanurate dans ledit substrat est comprise entre 1,22 et 1,9 fois la densité du même polyisocyanurate dans son état moussant libre.
2. Elément intérieur de véhicule selon la revendication 1, caractérisé en ce que ledit mat de fibres de renforcement comprend des fibres de verre présentant un diamètre de 15 à 20 µm (microns) en moyenne et une longueur moyenne de plus de 50 mm.
3. Elément intérieur de véhicule selon la revendication 1, caractérisé en ce que la quantité de polyisocyanate utilisée pour obtenir ledit polyisocyanurate se situe entre 250 et 3 000 en indice d'isocyanate.
4. Elément intérieur de véhicule selon la revendication 3, caractérisé en ce que la quantité de polyisocyanate utilisée se situe entre 1 500 et 2 500 en indice d'isocyanate.
5. Elément intérieur de véhicule selon les revendications 1, 2 ou 3, caractérisé en ce que ladite couche de surface comprend une couche externe en plastique non expansé et une couche interne en plastique

expansé, qui sont formées par fusion d'une poudre plastique dans un moule chauffé.

6. Elément intérieur de véhicule selon les revendications 1, 2 ou 3, caractérisé en ce que ladite couche de surface comprend des couches d'un tissu, d'une mousse élastique et d'une feuille de résine thermoplastique.
7. Procédé de fabrication d'un élément intérieur de véhicule, caractérisé en ce qu'il comprend les étapes suivantes:
  - (a) pose d'une couche de surface dans une cavité d'un moule;
  - (b) superposition d'un mat de fibres de renforcement sur ladite couche de surface;
  - (c) compression de ladite couche de surface et dudit mat de fibres de renforcement dans le moule;
  - (d) injection de matière première dans la cavité du moule pour obtenir un polyisocyanurate, ledit polyisocyanurate présentant une densité, comprise entre 1,22 et 1,9 fois la densité du même polyisocyanurate dans son état moussant libre, ladite matière première comprenant un catalyseur de trimérisation, un polyisocyanate polyol et n'ayant aucun agent gonflant organique, et
  - (e) le démoulage d'un élément intérieur intégralement moulé une fois la réaction de la matière première terminée.
8. Procédé selon la revendication 7, caractérisé en ce que ledit mat de fibres de renforcement utilisé dans l'étape (b) comprend des fibres de verre présentant un diamètre de 15 à 20  $\mu\text{m}$  (microns) en moyenne et une longueur de plus de 50 mm en moyenne.
9. Procédé selon la revendication 7, caractérisé en ce que la teneur en polyisocyanate dudit polyisocyanurate injecté dans l'étape (d) se situe entre 250 et 3000 en indice d'isocyanate.
10. Procédé selon la revendication 7, caractérisé en ce que ledit catalyseur de trimérisation utilisé dans l'étape (d) peut être un ou plusieurs catalyseurs sélectionnés parmi un carboxylate, une amine tertiaire, un sel inorganique, une phosphine et un sel d'ammonium quaternaire.
11. Procédé selon la revendication 10, caractérisé en ce que ledit catalyseur de trimérisation est un sel de métal alcalin d'un acide carboxylique contenant 1 à 18 atomes de carbone.
12. Procédé selon la revendication 7, caractérisé en ce que dans l'étape (d) on utilise du dilaurate de dibutylétain comme catalyseur secondaire.
13. Procédé selon la revendication 7, caractérisé en ce que ledit polyol utilisé dans l'étape (d) peut être un ou plusieurs polyols sélectionnés parmi l'éthylène glycol, le diéthylène glycol, le néopentyl glycol, le 1,4-butanediol, du 1,6-héxanediol, le 1,4-cyclohexanediméthanol, le glycérol, le triméthylolpropane et le pentaérythritol.
14. Procédé selon la revendication 13, caractérisé en ce que ledit polyol est un polyol de polyester ou de polyéther, préparé à partir desdits polyols, mentionnés dans la revendication 13.
15. Procédé selon la revendication 7, caractérisé en ce que ledit polyisocyanate utilisé dans l'étape (d) peut être un ou plusieurs polyisocyanates sélectionnés parmi des polyisocyanates aliphatiques alicycliques et aromatiques.
16. Procédé selon la revendication 15, caractérisé en ce que ledit polyisocyanate aliphatique est l'hexaméthylènediisocyanate.
17. Procédé selon la revendication 15, caractérisé en ce que ledit polyisocyanate alicyclique est de l'isophoronediiisocyanate.
18. Procédé selon la revendication 15, caractérisé en ce que ledit polyisocyanate aromatique peut être le tolylènediisocyanate, le diphénylméthanediisocyanate, le naphthylènediisocyanate et le xylylènediisocyanate.
19. Procédé selon la revendication 7, caractérisé en ce que ledit moule est préchauffé de 60 à 80° dans

l'étape (a).

20. Procédé selon la revendication 7, caractérisé en ce que ledit polyol et ledit polyisocyanate utilisés dans l'étape (d) sont amenés séparément puis chargés ensemble sous forte pression par la buse dudit moule afin d'être injectés simultanément.
21. Procédé selon la revendication 7, caractérisé en ce que ledit moule est un moule fermé et en ce que l'on réduit la pression dudit moule fermé à une pression comprise entre 0,33 et 0,46 kg/cm<sup>2</sup> (entre 32,4 et 45,1 kPa) lors de l'injection dudit polyisocyanurate dans l'étape (d).
22. Procédé selon la revendication 7, caractérisé en ce que l'on applique un adhésif sur ladite couche de surface dans l'étape (a).
23. Procédé selon la revendication 7, caractérisé en ce que ledit moule se compose d'une moitié de moule inférieure et d'une moitié de moule supérieure et en ce que la moitié de moule inférieure est fermée par la moitié de moule supérieure après l'injection dudit matériau polyisocyanurate dans l'étape (d) afin de compléter la réaction dudit matériau dans l'étape (e).

## 20 Ansprüche

1. Innenfahrzeugglied mit einem Substrat, das eine mit Polyisocyanurat durchdrungene Verstärkungs-Fasermatte enthält, wobei das Polyisocyanurat durch Reaktion von Polyol und Polyisocyanat bei Anwesenheit eines Trimerisierungs-Katalysators und ohne ein organisches Blasmittel erhalten wurde; und mit einer Integral an diesem Substrat angeformten Oberflächenschicht, wobei die Dichte des Polyisocyanurats in diesem Substrat 1,22 bis 1,9 mal so groß wie die Dichte desselben Polyisocyanurats in seinem ungebundenen aufgeschäumten Zustand ist.
2. Innenfahrzeugglied nach Anspruch 1, bei dem diese Verstärkungs-Fasermatte Glasfasern aufweist, die im Durchschnitt einen mittleren Durchmesser von 15 bis 20 µm und eine mittlere Länge von über 50 mm aufweisen.
3. Innenfahrzeugglied nach Anspruch 1, bei dem der Anteil des zum Darstellen des Polyisocyanurats verwendeten Polyisocyanats 250 bis 3000 gemäß dem Isocyanat-Index beträgt.
4. Innenfahrzeugglied nach Anspruch 3, bei dem der Anteil des verwendeten Polyisocyanats 1500 bis 2500 gemäß dem Isocyanat-Index beträgt.
5. Innenfahrzeugglied nach einem der Ansprüche 1, 2 oder 3, bei dem die Oberflächenschicht nicht-aufgeschäumtes Kunststoffmaterial als Außenschicht und aufgeschäumtes Kunststoffmaterial als Innenschicht enthält, die durch Schmelzen von Kunststoffpulver in einer erhitzten Form gebildet werden.
6. Innenfahrzeugglied nach einem der Ansprüche 1, 2 oder 3, bei dem die Oberflächenschicht Schichten aus einem Textilmaterial, einem elastischen Schaum und einem thermoplastischen Kunstharzblatt enthält.
7. Verfahren zur Herstellung eines Innenfahrzeugglieds, das die Verfahrensschritte aufweist:
  - (a) Einlegen einer Oberflächenschicht in die Ausnehmung einer Form;
  - (b) Auflegen einer Verstärkungs-Fasermatte auf diese Oberflächenschicht;
  - (c) Zusammenpressen dieser Oberflächenschicht und dieser Verstärkungs-Fasermatte in der Form;
  - (d) Einbringen von Rohmaterial zur Darstellung eines Polyisocyanurats in die Ausnehmung der Form, wobei dieses Polyisocyanurat eine Dichte aufweist, die 1,22 bis 1,9 mal so groß wie die Dichte desselben Polyisocyanurats in seinem ungebundenen, aufgeschäumten Zustand ist und wobei dieses Rohmaterial einen Trimerisierungs-Katalysator, ein Polyol, ein Polyisocyanat und kein organisches Blasmittel aufweist und
  - (e) Entformen eines integral geformten Innenglieds aus der Form nach Abschluß der Reaktion des Rohmaterials.

8. Verfahren nach Anspruch 7, bei dem die im Verfahrensschritt (b) verwendete Verstärkungs-Fasermatte Glasfasern aufweist, die im Durchschnitt einen mittleren Durchmesser von 15 bis 20  $\mu\text{m}$  und eine mittlere Länge von über 50 mm aufweisen.
- 5 9. Verfahren nach Anspruch 7, bei dem der Anteil des Polyisocyanats des im Verfahrensschritt (d) eingebrachten Polyisocyanurat-Materials 250 bis 3000 gemäß dem Isocyanat-Index beträgt.
10. Verfahren nach Anspruch 7, bei dem der im Verfahrensschritt (d) verwendete Trimerisierungs-Katalysator aus einem oder mehreren Stoffen besteht, die aus einem Carboxylat, einem tertiären Amin, einem anorganischen Salz, einem Phosphin und einem quartären Ammoniumsalz ausgewählt sind.
- 10 11. Verfahren nach Anspruch 10, bei dem der Trimerisierungs-Katalysator ein Alkalimetallsalz einer Karbonsäure ist, die 1 bis 18 Kohlenstoffatome enthält.
- 15 12. Verfahren nach Anspruch 7, bei dem Dibutylzinn-dilaurat im Verfahrensschritt (d) als Hilfskatalysator verwendet wird.
13. Verfahren nach Anspruch 7, bei dem das im Verfahrensschritt (d) verwendete Polyol aus einem oder mehreren Stoffen besteht, die aus Äthylenglykol, Diäthylenglykol, Neopentylglykol, 1,4-Butandiol, 1,6-Hexandiol, 1,4-Cyclohexandimethylol, Glycerol, Trimethylolpropan und Pentaerythrit ausgewählt sind.
- 20 14. Verfahren nach Anspruch 13, bei dem das Polyol ein Polyester-Polyol oder ein Polyäther-Polyol ist, das aus den im Anspruch 13 aufgeführten Polyolen dargestellt ist.
- 25 15. Verfahren nach Anspruch 7, bei dem das im Verfahrensschritt (d) verwendete Polyisocyanat aus einem oder mehreren Stoffen besteht, die aus einem aliphatischen Polyisocyanat, einem alizyklischen Polyisocyanat und einem aromatischen Polyisocyanat ausgewählt sind.
16. Verfahren nach Anspruch 15, bei dem das aliphatische Polyisocyanat aus Hexamethyldiisocyanat besteht.
- 30 17. Verfahren nach Anspruch 15, bei dem das alizyklische Polyisocyanat aus Isophorondiisocyanat besteht.
18. Verfahren nach Anspruch 15, bei dem das aromatische Polyisocyanat aus Toluylendiisocyanat, Diphenylmethandiisocyanat, Naphtalindiisocyanat oder Xylylendiisocyanat besteht.
- 35 19. Verfahren nach Anspruch 7, bei dem die Form im Verfahrensschritt (a) auf 60 bis 80 °C vorgeheizt wird.
20. Verfahren nach Anspruch 7, bei dem das im Verfahrensschritt (b) verwendete Polyol und Polyisocyanat getrennt gelassen werden und unter hohem Druck an einem Einlaß der Form ineinander geschossen werden, wobei sie simultan eingebracht werden.
- 40 21. Verfahren nach Anspruch 7, bei dem die Form als geschlossene Form ausgebildet ist und der Druck dieser geschlossenen Form bei der Einbringung des Polyisocyanurat-Materials im Verfahrensschritt (d) auf 0,33 bis 0,46  $\text{Kg/cm}^2$  (32,4 bis 45,1 kPa) reduziert wird.
- 45 22. Verfahren nach Anspruch 7, bei dem ein Klebstoff auf die Oberflächenschicht im Verfahrensschritt (a) aufgebracht wird.
- 50 23. Verfahren nach Anspruch 7, bei dem die Form aus einer unteren Formhälfte und einer oberen Formhälfte zusammengesetzt und die untere Formhälfte mittels der oberen Formhälfte nach der Einbringung des Polyisocyanurat-Materials im Verfahrensschritt (d) geschlossen wird, um die Reaktion dieses Materials im Verfahrensschritt (e) abzuschließen.

Fig. 1

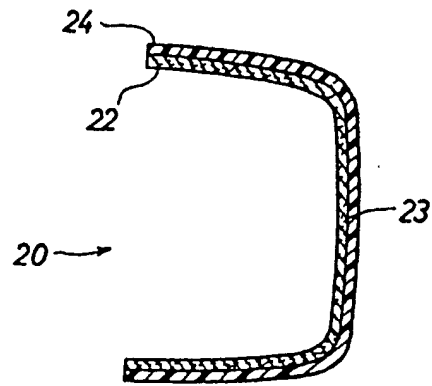


Fig. 2

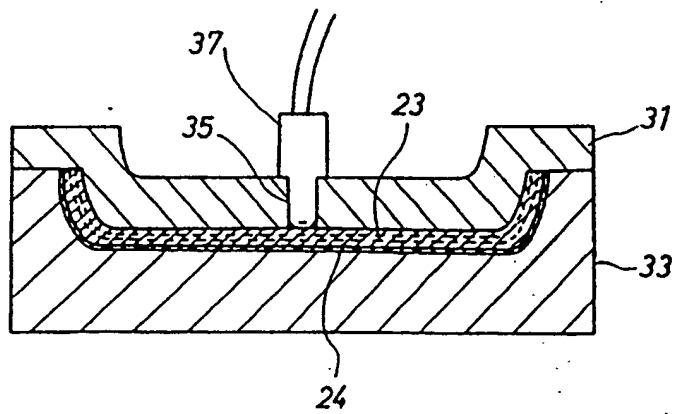


Fig. 3

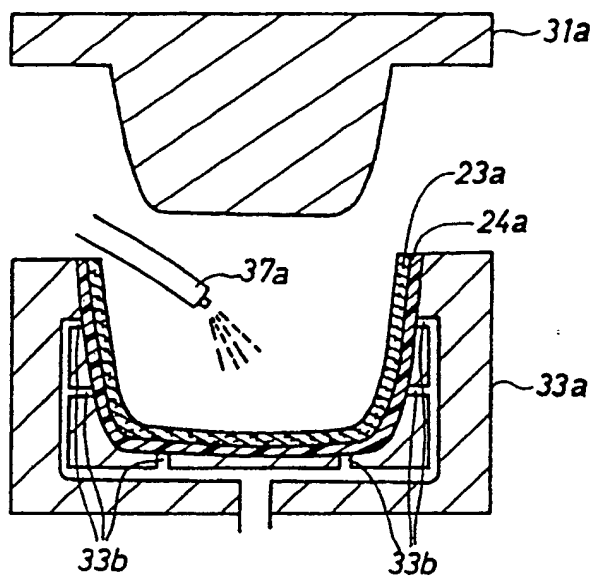


Fig. 4

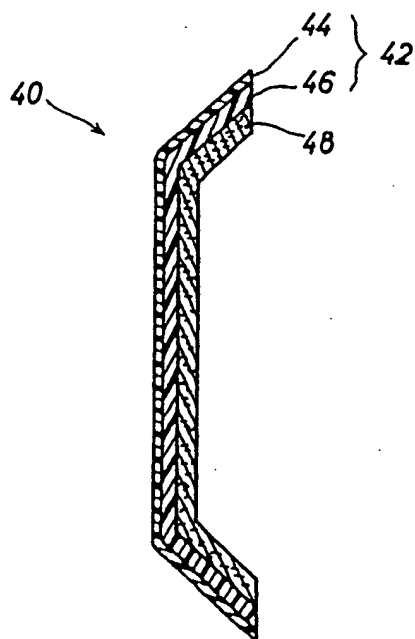
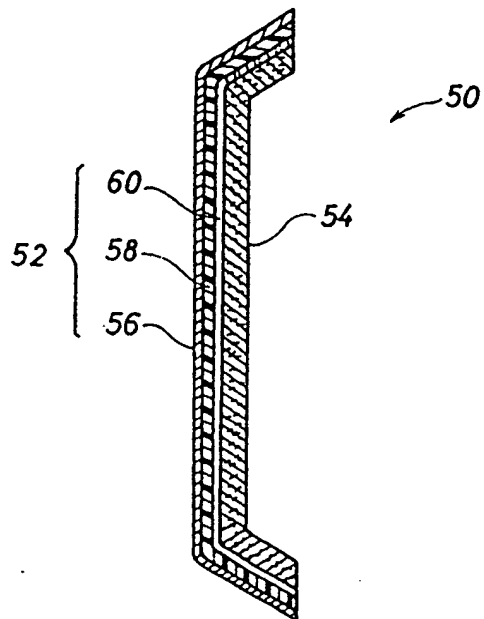




Fig. 5



EP 0 338 264

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Derwent WPI

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Plastics-covered wood materials - produced with wide variety of resins etc. by applying thermoplastics to material which adheres to wood and bonding to wood

Patent Assignee: BEHR GMBH & CO KG ERWIN (BEHR-N)

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Number of Countries: 006 Number of Patents: 007

Patent Family:

Patent No Kind Date Applicat No Kind Date Week

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Priority Applications (No Type Date): DE 3813025 A 19880419

Cited Patents: A3...9128; DE 1933286; DE 2422978; DE 2505979; FR 596783; GB 796131; NL 264672; No-SR.Pub; CH 356381

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DE 58906334 G B29C-067/18 Based on patent EP 338264

Abstract (Basic): EP 338264 A

Resin-bonded material is produced by applying a priming layer to the material to adhere to it, using a large specific area and using a layer to which the final resin can be bonded by injection moulding. When bonding wood materials thermoplastic polymer is applied first to the priming coat and the combination is bonded to the wood material.

ADVANTAGE - Method bonds the resin to the wood material permanently and eliminates shrinkage problems (which have arisen hitherto).

Dwg.0/0

Title Terms: PLASTICS; COVER; WOOD; MATERIAL; PRODUCE; WIDE; VARIETY; RESIN ; APPLY; THERMOPLASTICS; MATERIAL; ADHERE; WOOD; BOND; WOOD

Derwent Class: A32

International Patent Class (Main): B29C-067/18

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